BLUE ROCK ENVIRONMENTAL, INC.

FILE COPY

Mr. Mark Verhey
Humboldt County Health Department
Division of Environmental Health
100 H Street, Suite 100
Eureka, California 95501

May 18, 2005

Re: Response to HCDEH Letter dated February 14, 2005
Fortuna Beacon Petro Mart
390 South Fortuna Boulevard, Fortuna, CA
HCDEH LOP No. 12093
Blue Rock Project No. FNC-3

Dear Mr. Verhey,

Blue Rock Environmental, Inc. (Blue Rock) has received the Humboldt County Division of Environmental Health's (HCDEH's) letter dated February 14, 2005 which responded to previous Blue Rock *Groundwater Monitoring Report and Groundwater Extraction System Reports* for the referenced site. This letter responds to HCDEH questions/comments in their letter. For the ease of review, individual comments are cited (in italics) and responded to in sequence.

Comment 1
Show depth to water for MW-13 on Figures 6B and 6C. Table One indicates depth to water averages less than four feet. Figures 6B and 6C show water depth at 11 feet. Comment on depth to water observed in MW-2, RW-4B, and MW-13. What conditions are causing this area of shallow groundwater? What data can be used to evaluate your interpretation? Did any previous holes, specifically holes less than 10 feet deep, have water? Were any shallow holes left open for an extended period of time to evaluate the possibility of a shallow, perched water table? Does data from the adjacent site, Cash Oil, provide useful information?

The groundwater levels from the first quarter 2005 monitoring event are shown on Figure 6b and 6c (attached). The shallow water levels observed MW-2, RW-4B, and MW-13 may be the result of localized, perched zone, as past drilling and excavation observations possibly indicate thin, laterally discontinuous zones at depths of approximately 5 feet bgs. These conditions have been specifically observed during previous drilling of wells MW-1, MW-2 and MW-11, as intersecting a seasonal (December through June) shallow water-bearing (perched) zone (~4-8 feet bgs). Additionally, during the drilling of DW-1 through DW-3 in April 1996, soil samples collected at a depth of approximately 5 feet bgs were described as "wet", yet no water collected in the borehole. Also, during drilling of RW-4, the hole was dry to a depth 20 feet. RW-4 was drilled with the intention to collect and remove LNAPL on groundwater; however, no water entered this borehole and it was grouted without construction of a well. It is unknown how long previous borings were left open, and at which depths, to allow water to accumulate.

Blue Rock reviewed numerous photographs of excavation sidewalls for both this site and the nearby Cash Oil site.

During the excavation of EX-2, the condition of the hole was observed and photographed at depths of 5, 8, and 12 feet bgs; however, no water accumulated at those depths. Excavation of EX-2 continued, and water with floating LNAPL was encountered at a depth of approximately 14 feet bgs, which began to rise rapidly. This condition suggests that this water bearing zone may be confined.

During the excavation for EX-1, the condition of the hole was similar to that for EX-2, except for the following observations. A thin (~1 foot thick) lens at approximately 10 feet bgs contained water, which slowly dripped down the sidewall. During excavation of EX-1, water with floating LNAPL was encountered at a depth of approximately 20 feet bgs, which also rise rapidly. Stabilized water level in the excavation after standing for a night was approximately 16 to 17 feet bgs.

At the Cash Oil site, the excavation was deepened to a final depth of 18 feet bgs, at the deepest location. Groundwater was observed just at the base of the excavation (i.e. 18 feet bgs), but no appreciable free water collected in the excavation or seeped down the sidewall. A thin (~<1 foot thick), moist bed was observed at a depth of approximately 4 feet bgs. This unit was gray and appears to be fine-grained (silt/clay), but no water was observed emanating from the bed, or dripping down the excavation sidewall.

Comment 2
Comment on the drawdown effect of pumping? Is EX-1 pulling water from the deeper zone? Are the shallow and deep zones hydraulically connected? What data did you use to come to you interpretation?

Blue Rock is of the opinion that, although mostly separated by fine-grained soil, the shallow and deep water bearing zones appear to be connected in the area of DW-3, based on logs for DW-3 and cross-section construction (Figure 6c). Because of this apparent sedimentilogical connection and since EX-1 basin appears to tap into the deep water bearing zone (Figure 6c), Blue Rock believes the groundwater extraction system is affecting the deep water bearing zone. This is supported by the fact that the deep wells show progressive clean-up since start-up of the system.

Comment 3

MW-1 and DW-1 are screened from 5-20 and 30-40 feet bgs, respectively, and located five feet from each other. There is a dramatic change in the data beginning in approximately March 2001. Prior to this time, there was an average four-foot difference in the relative elevation of water in MW-1 and DW-1. Since this time, depth to water has differed by an average of 0.3 feet. Please comment on this observation.

Blue Rock plotted groundwater elevations versus time for MW-1 and DW-1. Blue Rock concurs that the difference in groundwater elevation between the two wells diminishes to approximately less than 0.5-feet beginning around March 2001. Before that time, groundwater in MW-1 was typically higher than DW-1 by about three feet on average. The plot shows that groundwater elevations for MW-1 have fallen to the levels of DW-1, while, the groundwater elevations of DW-1 have remained relatively consistent in their seasonal patterns. The remedial excavation and EX-1 installation occurred in August 2001, and the groundwater extraction system started in August 2002. Based on the timeline, groundwater elevations for MW-1 and DW-1 began to coincide about six months before remedial excavation began and about one-a-half years before groundwater extraction began. Although these remedial activities would be the first apparent reason for these groundwater changes, the chronology of events suggests that it is most likely a natural occurrence. Because these two wells are located proximal to each other, it would suggest a downward vertical gradient prior to March 2001 in the area of MW-1/DW-1, and then little to no significant vertical gradient thereafter. It is possible that these conditions may also suggest that the groundwater extraction system is dewatering the shallow zone in the area of MW-1, and/or that the groundwater levels are responding to the installation of EX-1 which appears to tap into both zones (Figure 6b). Although EX-1 may tap into both zones, operation of the system appears to have a beneficial effect on the deep zone wells, as dissolved-phase concentrations have decreased to below NCRWQCB levels in all three deep wells for approximately the last four quarters.

Comment 4 and 5

Blue Rock provided several graphs of concentrations versus time in selected wells. The graphs encompass the time period from the startup of the pump and treat system to the present. The data for MW-1 and MW-4 show a slow rate of decline of concentrations. The slope of the trendline for TPHg in MW-1 and MW-4, which are located within the areas of soil contamination, is negative 0.0003x and 0.00007x, respectively. The negligible slope of the trendline indicates a persistently strong source.

The table First Order Decay Rates shows the exponent [coefficient] of the trend line converted to a percent per day. Please provide a reference for this conversion.

Blue Rock uses the method presented by Buscheck, O'Reilly, and Nelson (1993) to calculate first-order decay rates by the following equation:

$$C(t) = C_0 e^{-(kt)}$$

Where,

C(t) is concentration as a function of time (t)
C_0 = is concentration as t = 0
k = is the decay rate (t^{-1})

Even though the raw degradation rate is in units of day^{-1}, these authors convert to units of percent/day in their paper, by simply multiplying the unitless numerator by 100, to make the unit more palatable for discussion.

Blue Rock quickly found other papers or presentations where first-order decay rates were converted to percent/day following a limited review of literature:

- Buscheck, O'Reilly, and Nelson (1993)
- Chiang, et al. (1989)
- Fulford, Gwinn, and Allan (1997)
- McAllister and Chiang (1994)

Conversion of first-order decay rates from day^{-1} to percent/day is a simple mathematical exercise practitioners use to make the rates more comprehensible. Blue Rock is comfortable presenting and discussing the rates in either unit; however, future data will be presented to the HCDEH in units of day^{-1}, as that appears to be their desired unit.

Comment 6

There is little change, since the duration of the operation of the remediation system, in the ratio of volume of water pumped versus pounds of hydrocarbons removed. Consequently, the system appears efficient at removing hydrocarbons from the water. However, the slow rate of degradation of the source and existing concentrations indicated the site will not reach water quality objectives in a reasonable amount of time. We recommend either increasing the pumping rate, for example including MW-4 as a pumping location, or evaluating the feasibility of a different approach. Please verify the diameters of existing monitoring wells.

Blue Rock has increased the pumping rates by lowering the "high" and "low" pumping sensors in each extraction well. The high sensor is set at a depth of approximately 16.5 feet bgs in EX-1, and a depth of approximately 15.5 feet bgs in EX-2. These are the approximate minimum drawdown in each extraction well. Current operation and maintenance data indicate the system is now extracting approximately 200,000 gallons/month, which is a significant increase over the approximate 88,000 gallons/month reported in the first quarter 2005 report. This increase in pumping rate will likely result in a greater zone and capture and hydrocarbon recovery.

Following review of well purging data, MW-4 cannot yield significant rates of groundwater. Therefore, Blue Rock does not believe it is a candidate for inclusion into the groundwater extraction grid.

A summary of monitoring well construction data (and casing diameters) was included in the referenced reports as Table 4, and is attached here again for review.

Comment 7
If you choose the option of evaluating the feasibility of a different option, we recommend focusing remediation of soil contamination, rather than contamination in water. In your review of different options, please provide an assessment of the remaining soil contamination in excess of 50-100 ppm TPHg.

Blue Rock agrees it may be useful to evaluate the feasibility of other remedial options to compliment the existing approach. We also concur that a thorough understanding of soil contamination is needed to help evaluate the feasibility of other options. Blue Rock reviewed cumulative site data and there appears to be a gap in soil impact data beneath the existing dispenser islands, as potential concentrations in that area are unknown. Therefore, Blue Rock recommends developing a workplan to further evaluate soil impacts underneath the dispenser island. Following a better understanding of current soil impacts, additional remedial options will be evaluated.

Comment 8
Thank you for your response regarding the absence of flow meters on the pump and treat system. We understand that water is pumped fromEX-1 and EX-2 into a holding tank. We understand there are sample ports on the influent lines but currently there is no way to measure the volume pumped [individually] from either EX-1 or EX-2. Without knowing the volume pumped from the individual points, there is a significant amount of uncertainty in your calculations regarding pounds of hydrocarbons removed. The reason for not installing flow meters is a concern about potential backpressures. Please elaborate on the reasoning for not installing flow meters in your next report.

The ratio of pumping rates from EX-1 and EX-2 are based on pilot test results. Installing additional filters and flow meters on each line, in addition to the existing filters, flowmeter/totalizer, and three carbon canisters, will only increase the hydraulic head against the submersible pumps. This will result in potentially reducing pumping rates and the longevity of the electric pump motors. Blue Rock believes, for the sake of estimating hydrocarbon mass removed, the existing system configuration is satisfactory.

Comment 9
We recommend measuring depth to water in all existing monitoring wells each quarter.

Blue Rock currently measures depth to water in 19 of 21 wells at the site, except MW-8 and MW-10. These wells will be monitored in the future for water depth, barring any access or safety issues.

Closing

Please note that previous HCDEH letters have mistakenly referred to Blue Rock as a different consultant name or compounded our name with other consultant names, including the HCDEH letter referenced herein. In the future, it would be greatly appreciated if the HCDEH would use the correct company name.

References

Buscheck, T.E., O'Reilly, K.T., and Nelson, S.N. 1993. *Evaluation of Intrinsic Bioremediation at Field Sites*. Proceedings of the Conference of Petroleum Hydrocarbons and Organic Chemicals in Ground Water, National Groundwater Association/API, Houston, TX. November 10-12.

Chiang, C.Y., Salanitro, J.P., Chai, E.Y., Colthart, J.D., and Klein, C.L. 1989. *Aerobic Biodegradation of Benzene, Toluene, and Xylene in a Sandy Aquifer-Data Analysis and Computer Modeling.* Ground Water, Vol. 27, No. 6, November-December 1989.

Fulford, M.F., Gwinn, B.M.*, and Allan, R.J. 1997. *Comparison of Natural Attenuation Processes in Two Fuel Hydrocarbon Plumes*. Proceedings of the Eleventh National Outdoor Action Conference - National Groundwater Association, p. 65. (* Presenter)

McAllister, P.M. and Chiang, C.Y. 1994. *A Practical Approach to Evaluating Natural Attenuation of Contaminants in Ground Water*. Groundwater Monitoring and Remediation, Spring 1994, p. 161-173.

Certification

This letter was prepared under the supervision of a California Professional Geologist at Blue Rock. All statements, conclusions, and recommendations are based upon published results from past consultants, field observations by Blue Rock, and analyses performed by a state-certified laboratory as they relate to the time, location, and depth of points sampled by Blue Rock. Interpretation of data, including spatial distribution and temporal trends, are based on commonly used geologic and scientific principles. It is possible that interpretations, conclusions, and recommendations presented in this report may change, as additional data become available and/or regulations change.

Information and interpretation presented herein are for the sole use of the client and regulating agency. The information and interpretation contained in this document should not be relied upon by a third party.

The service performed by Blue Rock has been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions in the area of the site. No other warranty, expressed or implied, is made.

If you have any questions regarding this project, please contact us at (707) 441-1934.

Sincerely,
Blue Rock Environmental, Inc.

Scott Ferriman
Project Scientist

Brian Gwinn, PG
Principal Geologist

Attachments:

HCDEH letter dated February 14, 2005

Figure 6a: Site Plan with Cross Section Layout
Figure 6b: East-West Soil Cross Section
Figure 6c: North-South Soil Cross Section

Table 4: Well Construction Details

Plot: MW-1 vs DW-1 Groundwater Elevation
Plot: MW-14 vs DW-2 Groundwater Elevation
Plot: MW-5 vs DW-3 Groundwater Elevation

Distribution:

Mr. Jim Seiler, Humboldt Petroleum, Inc. P.O. Box 131, Eureka, CA 95502

Ms. Kasey Ashley, NCRWQCB, 5550 Skylane Blvd., Ste. A, Santa Rosa, CA 95403

Humboldt County Department of Health and Human Services
DIVISION OF ENVIRONMENTAL HEALTH
100 H Street - Suite 100 - Eureka, CA 95501
Voice: 707-445-6215 - Fax: 707-441-5699 - Toll Free: 800-963-9241
envhealth@co.humboldt.ca.us

FILE COPY

February 14, 2005

Humboldt Petroleum Incorporated
Attn: Mr. James Seiler, Vice President
PO Box 131
Eureka, California 95502-0131

Subject: **HPI -- Fortuna Beacon**
390 South Fortuna Boulevard, Fortuna, California
LOP # 12093

Dear Mr. Seiler:

Thank you for *Groundwater Monitoring and Groundwater Extraction System Reports*, prepared by Blue Rock Clearwater Group, Inc. Thank you for responding to our previous questions. We understand the existing conceptual model of site conditions includes a shallow water bearing zone from 13-23 feet below ground surface (bgs) and a deep water bearing zone from approximately 25–40 feet bgs. All wells are screened within the shallow water bearing zone, except DW-1, DW-2, and DW-3, which are screened from 30-40 feet. We understand the existing pump and treat system has, to date, removed approximately one million gallons of water and 140 pounds of hydrocarbons. We have the following comments and observations.

- Show depth to water for MW-13 on Figures 6B and 6C. Table One indicates depth to water averages less than four feet. Figures 6B and 6C show water depth at 11 feet. Comment on depth to water observed in MW-2, RW-4B, and MW-13. What conditions are causing this area of shallow groundwater? What data can be used to evaluate your interpretation? Did any previous holes, specifically holes less than 10 feet deep, have water? Were any shallow holes left open for an extended period of time to evaluate the possibility of a shallow, perched water table? Does data from the adjacent site, Cash Oil, provide useful information?

- Comment on the drawdown effect of pumping? Is EX-1 pulling water from the deeper zone? Are the shallow and deep zones hydraulically connected? What data did you use to come to your interpretation?

- MW-1 and DW-1 are screened from 5-20 and 30-40 feet bgs, respectively, and located five feet from each other. There is a dramatic change in the data beginning in approximately March 2001. Prior to this time, there was an average four-foot difference in the relative elevation of water in MW-1 and DW-1. Since this time, depth to water has differed by an average of 0.3 feet. Please comment on this observation.

- Blue Rock provided several graphs of concentrations versus time in selected wells. The graphs encompass the time period from startup of the pump and treat system to the present. The data for MW-1 and MW-4 show a slow rate of decline of concentrations. The slope of the trendline for TPHg in MW-1 and MW-4, which are located within areas of soil

contamination, is a negative 0.0003x and 0.00007x, respectively. The negligible slope of the trendline indicates a persistently strong source.

- The table for First Order Decay Rates shows the exponent of the trend line converted to percent per day. Provide a reference for this conversion.

- There is little change, since the duration of operation of the remediation system, in the ratio of volume of water pumped versus pounds of hydrocarbons removed. Consequently, the system appears efficient at removing hydrocarbons from water. However, the slow rate of degradation of the source and the existing concentrations indicates the site will not reach water quality objectives in a reasonable amount of time. We recommend either increasing the pumping rate, for example by including MW-4 as a pumping location, or evaluating the feasibility of a different approach. Please verify the diameters of existing monitoring wells.

- If you choose the option of evaluating the feasibility of a different option, we recommend focusing on remediation of soil contamination, rather than contamination in water. In your review of different options, please provide an assessment of the remaining soil contamination in excess of 50-100 ppm TPHg.

- Thank you for your response regarding the absence of flow meters on the pump and treat system. We understand water is pumped from EX-1 and EX-2 into a holding tank. We understand there are sample ports on the influent lines but currently there is no way to measure the volume pumped from either EX-1 or EX-2. Without knowing the volume pumped from the individual points, there is a significant amount of uncertainty in your calculations regarding pounds of hydrocarbons removed. The reason given for not installing flow meters is a concern about potential backpressures. Please elaborate on the reasoning for not installing flow meters in the your next report.

- We recommend measuring depth to water in all existing monitoring wells each quarter.

If you have any questions please contact Mark Verhey at 268-2208.

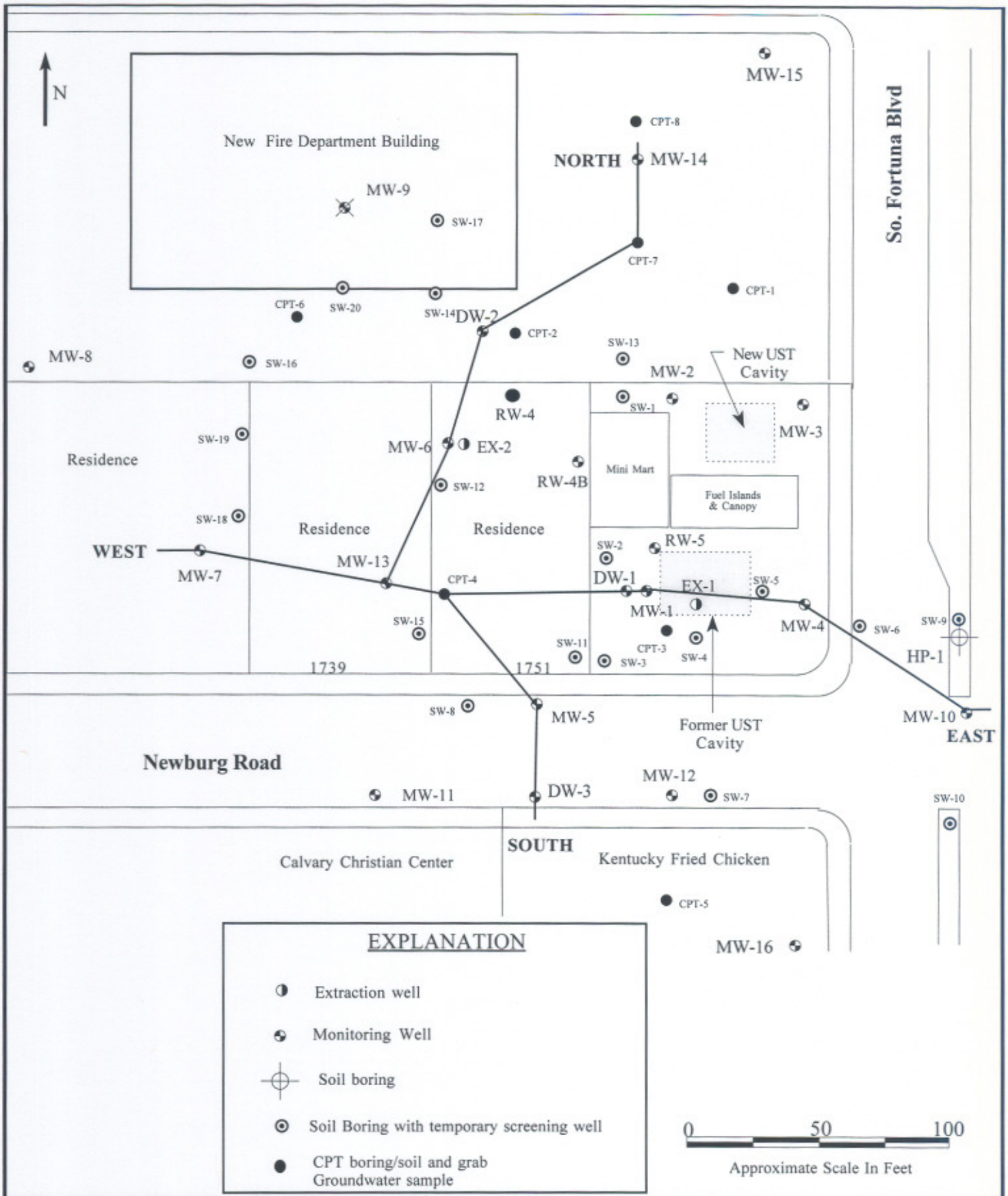
Sincerely,

Mark Verhey, Geologist
Humboldt County Local Oversight Program

MAV: swb

cc: Scott Ferriman, Blue Rock Inc.
Brian Gwinn, Blue Rock Inc.

12093.031/424L

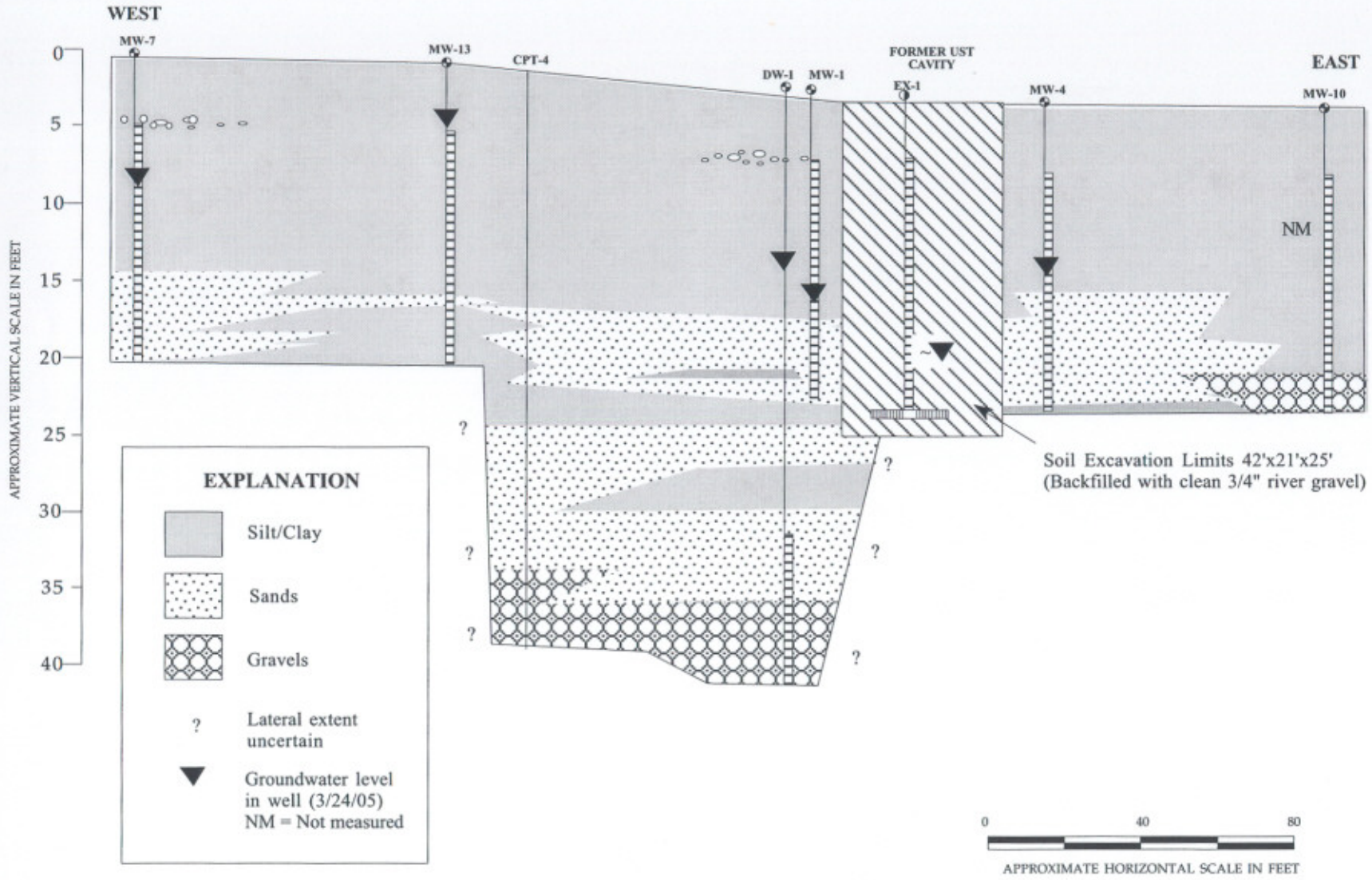


Site Plan Showing Cross Section Layout

Fortuna Beacon Petro Mart
390 South Fortuna Boulevard
Fortuna, California

BLUE ROCK ENVIRONMENTAL, INC.

Project No.	Report Date	Figure
FNC-3	5/05	6a

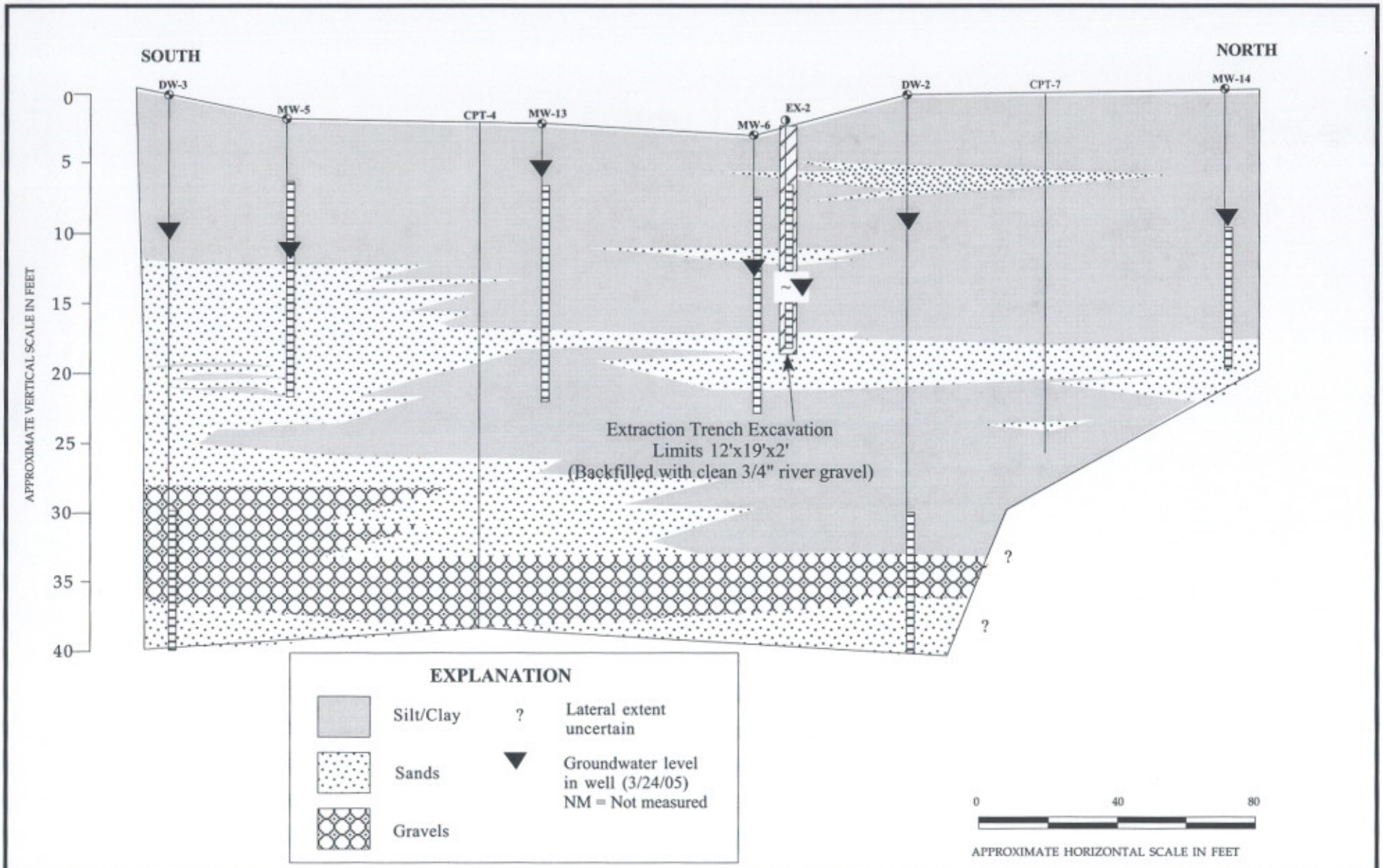


East-West Soil Cross Section

Fortuna Beacon Petro Mart
390 South Fortuna Boulevard
Fortuna, California

BLUE ROCK ENVIRONMENTAL, INC.

Project No.	Figure Date	Figure
FNC-3	5/05	6b



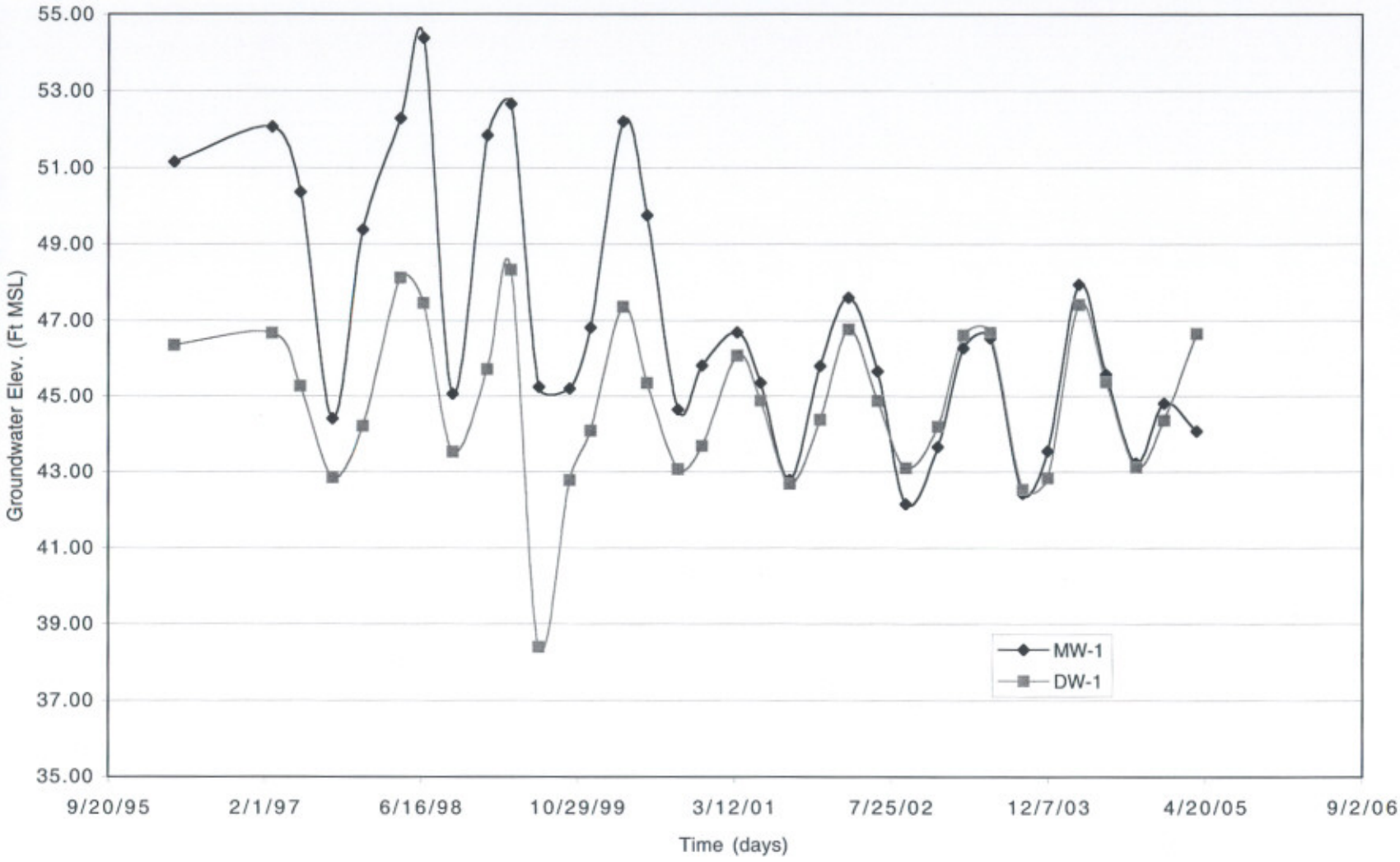
North-South Soil Cross Section

Fortuna Beacon Petro Mart
390 South Fortuna Boulevard
Fortuna, California

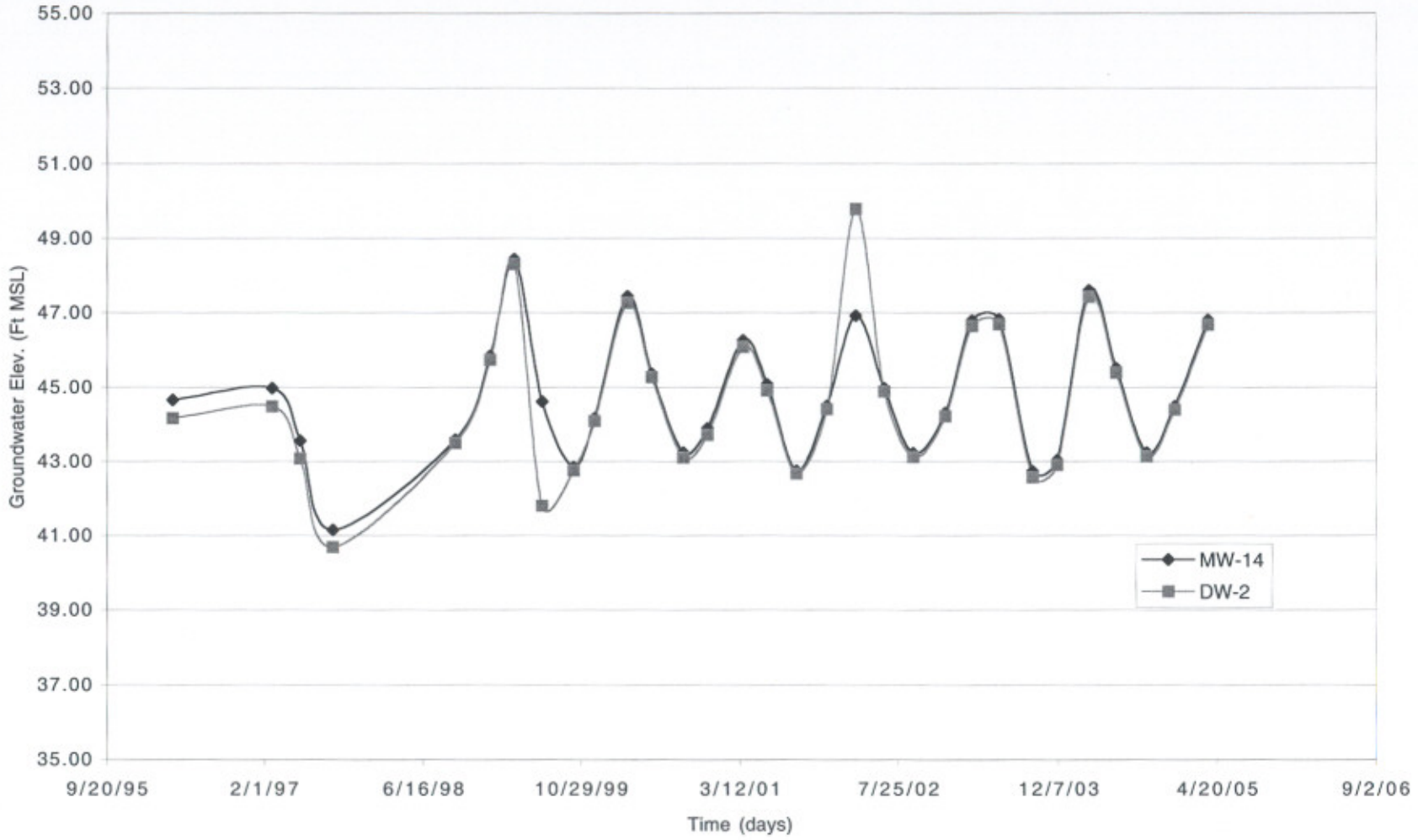
BLUE ROCK ENVIRONMENTAL, INC.

Project No.	Figure Date	Figure
FNC-3	5/05	6c

MW-1 vs DW-1 Groundwater Elevation
Fortuna Beacon Mini mart
390 S. Fortuna Blvd., Fortuna, CA



MW-14 vs DW-2 Groundwater Elevation
Fortuna Beacon Mini Mart
390 S. Fortuna Blvd., Fortuna, CA



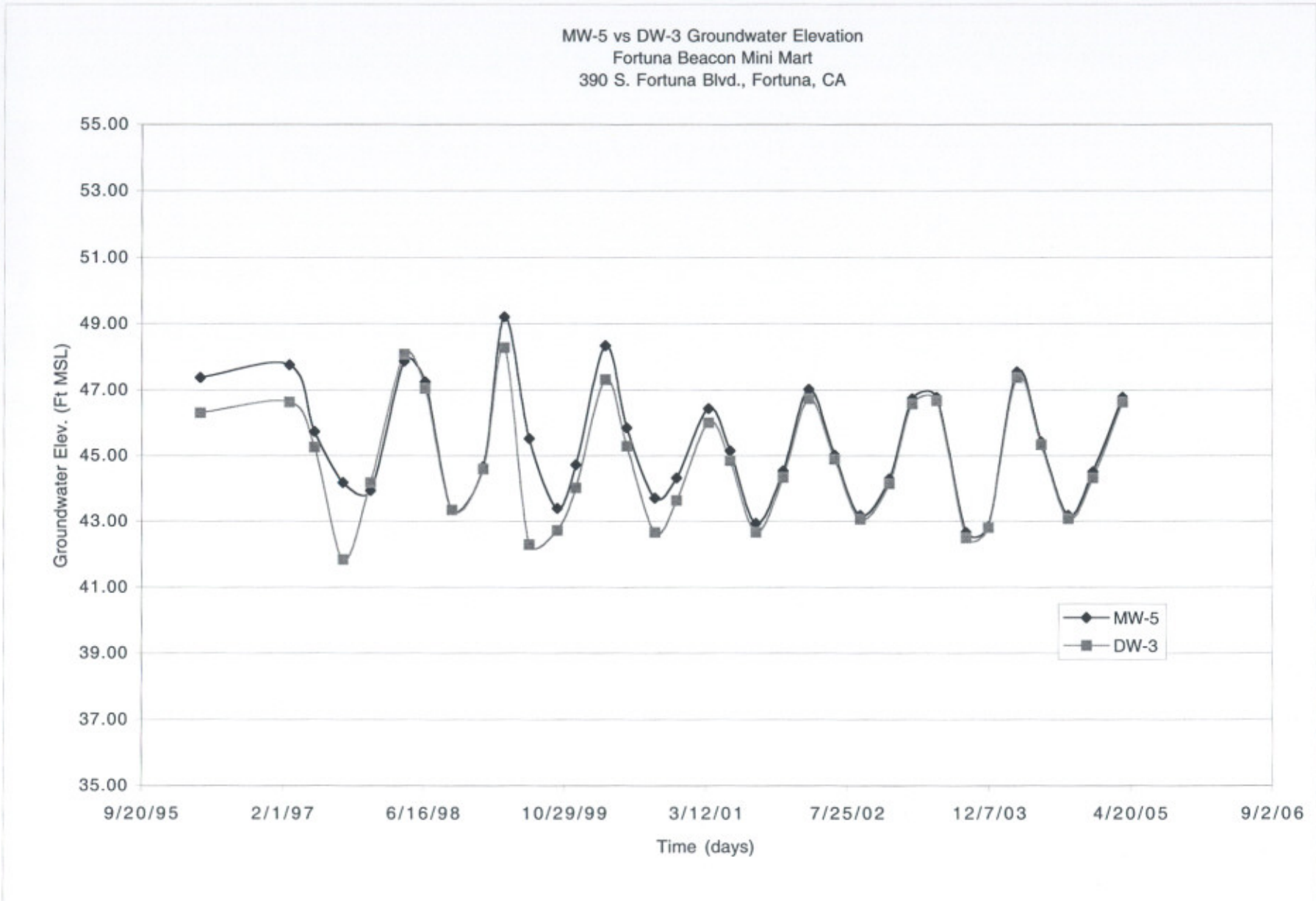

MW-5 vs DW-3 Groundwater Elevation
Fortuna Beacon Mini Mart
390 S. Fortuna Blvd., Fortuna, CA
55.00
53.00
51.00
49.00
47.00
45.00
43.00
41.00
39.00
37.00
35.00
Groundwater Elev. (Ft MSL)
9/20/95
2/1/97
6/16/98
10/29/99
3/12/01
7/25/02
12/7/03
4/20/05
9/2/06
Time (days)
MW-5
DW-3

Table 4
WELL CONSTRUCTION DETAILS
Fortuna Beacon Petro Mart
309 South Fortuna Boulevard
Fortuna, California
Blue Rock Project No. FNC-3

Well Identification	Date Intstalled	Intstalled by	Casing Diameter (inches)	Total Depth (feet)	Blank Interval (feet)	Screened Interval (feet)	Slot Size (inches)	Filter Pack (feet)	Bentonite Seal (feet)	Cement (feet)	First Encountered Groundwater (feet bgs)
MW-1	2/27/90	Laco	4	20	0-5	5-20	0.02	4-20	3-4	0-3	6
MW-2	2/27/90	Laco	4	20	0-5	5-20	0.02	4-20	3-4	0-3	6
MW-3	2/27/90	Laco	4	20	0-5	5-20	0.02	4-20	3-4	0-3	12
MW-4	6/30/92	Laco	4	20	0-5	5-20	0.02	4-20	3-4	0-3	16.5
MW-5	6/30/92	Laco	4	20	0-5	5-20	0.02	4-20	3-4	0-3	13.2
MW-6	7/1/92	Laco	4	20	0-5	5-20	0.02	4-20	3-4	0-3	15.5
MW-7	10/22/92	Laco	4	20	0-5	5-20	0.02	4-20	3-4	0-3	14
MW-8	10/21/92	Laco	4	20	0-5	5-20	0.02	4-20	3-4	0-3	13
MW-9*	10/21/92	Laco	4	20	0-5	5-20	0.02	4-20	3-4	0-3	18
MW-10	10/16/92	Laco	4	20	0-5	5-20	0.02	4-20	3-4	0-3	17
MW-11	10/19/02	Laco	4	20	0-5	5-20	0.02	4-20	3-4	0-3	18
MW-12	12/3/93	Laco	4	20	0-5	5-20	0.02	4-20	3-4	0-3	10
MW-13	12/6/93	Laco	4	20	0-5	5-20	0.02	4-20	3-4	0-3	5
MW-14	4/2/96	Clearwater	2	20	0-10	10-20	0.02	9-20	7-9	0-7	15
MW-15	7/21/98	Clearwater	2	20	0-10	10-20	0.02	9-20	7-9	0-7	15
MW-16	7/21/98	Clearwater	2	20	0-10	10-20	0.02	9-20	7-9	0-7	4.5
DW-1	4/3/96	Clearwater	2	40	0-30	30-40	0.02	27-40	25-27	0-27	18
DW-2	4/4/96	Clearwater	2	40.5	0-30	30-40.5	0.02	27-40.5	25-27	0-27	20
DW-3	4/4/96	Clearwater	2	40.5	0-30	30-40.5	0.02	27-40.5	25-27	0-27	15
RW-1*	10/23/00	Clearwater	4	20	0-5	5-20	0.01	4-20	3-4	0-3	10
RW-2*	10/23/00	Clearwater	4	20	0-5	5-20	0.01	4-20	3-4	0-3	5.5
RW-3*	10/23/00	Clearwater	4	20	0-5	5-20	0.01	4-20	3-4	0-3	5.5
RW-4B	10/23/00	Clearwater	4	20	0-5	5-20	0.01	4-20	3-4	0-3	3
RW-5	10/23/00	Clearwater	4	20	0-5	5-20	0.01	4-20	3-4	0-3	8

* : Destroyed by overdrilling and grouted with neat cement or removed during remedial soil excavation